Rhodora

JOURNAL OF

THE NEW ENGLAND BOTANICAL CLUB

Vol. 23. July, 1921. No. 271.

THE GRAY HERBARIUM EXPEDITION TO NOVA SCOTIA

1920.

M. L. Fernald.

(*Continued from p. 152.*)

Luckily Bissell's boat got in promptly, although so baffled by the dense fog (now rapidly approaching the 400-hour mark) that she had difficulty in making the landing. Bissell had barely time to change his clothes before it was time to start for Lower Argyle, for I was anxious to get back to the quagmire White and I had been forced to leave only partly explored, and the others were ready to visit this particularly accessible station for *Schizaea*. The quagmire kept us busy most of the forenoon, chiefly with the collection and study of the amazingly abundant and perplexing representatives of the coastal plain genus *Bartonia*. The genus was now at the height of flowering and for the next two weeks we diligently and unintelligently collected these plants wherever we went. As currently recognized, *Bartonia* consists of four species: the strictly southern *B. verna*, apparently unique and ranging from Louisiana to southern Virginia; *B. virginica*, which seems to be a well-behaved and constant plant, ranging northeastward to the drier barrens of Nova Scotia; *B. paniculata*, extending from Louisiana and Florida to York County, Maine; and the endemic Newfoundland *B. iodandra*. Our constant embarrassment was regarding the two latter. The typical southern *B. paniculata* is a yellowish-green plant with the flowers in compound, thrysoid inflorescences; with firm and subulate, yellowish leaves and calyx-lobes, the calyx cleft to the base; the corolla-lobes translucent to creamy-white and the anthers yellow. In the New-

foundland *B. iodandra*, on the other hand, the plant is purple-tinged and bears a simple or subsimple raceme with elongate pedicels; the blunt leaves are oblong or ovate and fleshy; the calyx is cleft only two-thirds or three-fourths to the base into herbaceous, oblong or ovate lobes; the corolla is decidedly petaloid and its white or purplish lobes much longer than in *B. paniculata*, and the anthers are usually purple. Unfortunately, however, wherever in Nova Scotia we found the typical southern *B. paniculata*, it was usually, if not always, associated with a coarser plant with simpler inflorescences, purplish color, larger corolla and purple anthers, in these characters closely approaching *B. iodandra* of Newfoundland. In Nova Scotia the two plants so freely intergrade that it is most difficult to draw a sharp line between them. The trouble is not a new one. In 1894 the late Dr. Geo. G. Kennedy and Mr. Emile F. Williams found an intermediate plant in a sphagnous swamp in Norfolk County, Massachusetts, and in 1900 Williams published[1] an account of it and an illustration as *B. iodandra;* and Bicknell, finding the same intermediate plant on Nantucket, took it in 1915 to be unquestionably *B. iodandra*, but stated that "It is found also on Martha's Vineyard and apparently, also, on Long Island, not always, however, perfectly maintaining the characters of its typical form, and certain rather dubious examples undoubtedly raise the question whether it may not be intergradient with *Bartonia paniculata.*"[2] Subsequently, partly in response to an argument for which I am responsible, Bicknell has dropped[3] *B. iodandra* from his Nantucket list; but our extensive collections from Nova Scotia and a prolonged but unsuccessful endeavor to find true specific characters for *B. iodandra* convince me that both he and Williams originally hit very near the truth. On its constantly less deeply cleft calyx and its larger corolla *B. iodandra* can be maintained as a Newfoundland variety of *B. paniculata*, while the intermediate plant of Nova Scotia at least is best treated as a transitional variety.

But, to return to the barren at Lower Argyle. The slightly elevated, bushy knolls in the barren were often covered by a dwarfed and contorted form of the coastal plain *Thelypteris simulata*, already

[1] Williams, RHODORA, ii. 55, t. 15, fig. 5 (1900).
[2] Bicknell, Bull. Torr. Bot. Cl. xlii. 33 (1915).
[3] Bicknell, Bull. Torr. Bot. Cl. xlvi. 423 (1919).

found by us, but now, as it was maturing, becoming more obvious than heretofore. *Drosera longifolia* and *D. rotundifolia* were, of course, abundant but a plant which exactly combines their characteristics and which is unquestionably a hybrid between them was found on only one knoll.

Suddenly Long remarked: "If we were in southern Jersey we should call this *Agrostis elata*." And surely that is what it proves to be but, instead of being confined to the Argyle barren *A. elata* Pursh, heretofore recorded from east of Long Island only on Nantucket,[1] was found on all the boggy barrens from Digby and Yarmouth Counties to Queens. Dr. St. John got it on Sable Island; he, Long and I collected it in 1912 on the Magdalen Islands and it is common in Newfoundland. Many of the specimens are absolutely inseparable from material from Pursh's type region (New Jersey), but others have conspicuously awned spikelets. These vary in length from 3.3–4 mm. and in this outlying Canadian and Newfoundland area the plant passes clearly into *A. hyemalis* and its var. *geminata* (Trin.) Hitchc. *A. elata* seems, therefore, to be a coastal plain extreme of *A. hyemalis* with very long spikelets, rather than a variant of *A. perennans* with which Hitchcock unites it.

Late in the afternoon, having made a good cross-section of the barren, we turned toward the sea-shore and, in following a path through an alder thicket, found a carpet of the European *Potentilla procumbens*, here, as when we afterward saw it at Baddeck, too near a cow-path for us to consider it indigenous. On the sea-beach *Rumex pallidus* was in prime condition and *Suaeda americana* was maturing. We had scarcely begun observing the beach plants when a downpour of rain warned us to hurry toward the village and the station, but, in scrambling through the bushes above the beach, we came upon such a handsome and now fully ripe colony of *Carex panicea* that we temporarily ignored the rain to dig some good specimens.

The southern shore of Salmon Lake had yielded so many good things that we were all anxious to see more of the sandy and peaty beach, and especially to extend our exploration up the wholly unsettled west side of the lake. So, on August 13, we landed at the brook where *Polygonum robustius* luxuriates. The boggy swale nearby had

[1]Bicknell, Bull. Torr. Bot. Cl. xxxv. 192 (1908).

Juncus subcaudatus and a peculiarly brittle and fastigiate-branched extreme of *Bartonia paniculata*, a variety heretofore known only from Sable Island. *Thelypteris simulata* was abundant in spruce and alder thickets and the handsome *Aster nemoralis*, var. *major* Peck[1] was beginning to bloom. The *Lycopus uniflorus* of these thickets had an unfamiliar appearance and upon returning to Cambridge I find it to be var. *ovatus* Fernald & St. John[2], recently described from Sable Island and Canso.

The blackish-fruited Chokeberry, *Pyrus arbutifolia*, var. *atro-purpurea*, is everywhere abundant in western Nova Scotia and had for some time shown its characteristic color, but here many of the smaller-leaved shrubs had the small berries just reddening and were obviously typical *P. arbutifolia*, not positively known nearer than Cape Cod and Plymouth County, Massachusetts. The inundated sandy margin of the lake was carpeted with unusually fine *Subularia aquatica* and a stranger happening along would have been amazed to see five men standing in water above their knees, bent over and intently watching the bottom and every few seconds making a plunge to the shoulder with the right arm. After lunch Bissell and Dr. and Mrs. Graves started toward Tusket to catch the train; but Long, Linder and I, having determined to make a circuit of the lake, kept on to the north. Everywhere the thicket was bordered by *Rubus tardatus* of Cape Cod and of York County, Maine, one of the most characteristic blackberries of these lake margins; and the ledgy shores had colonies of the *Panicum* so characteristic of the coastal region of southern New England, which has been referred to *P. virgatum*, var. *cubense*.

Approaching sunset warned us before we had got half the length of the west shore that our plan to encircle the lake was too ambitious. The fog was still with us and during the eight-mile road-walk into Yarmouth we amused ourselves vainly attempting to make out the outlines of more than two of the roadside telephone poles at a time, —an index to the extreme density of the atmosphere. It was some days after this, when the uninterrupted fog was in its fourth week,

[1] ASTER NEMORALIS Ait., var. MAJOR Peck, N. Y. State Mus. Ann. Rep. xlvii. 155—reprint, 29 (Jan., 1894). *A. nemoralis*, var. *Blakei* Porter, Bull. Torr. Bot. Cl. xxi. 311 (July 20, 1894).

[2] Proc. Bost. Soc. Nat. Hist. xxxvi. 92 (1921).

that Mrs. Graves wrote home that they had been there for a week but had not *seen* Yarmouth yet. Nevertheless, in spite of this heavy blanket of fog and the naturally late spring, green corn was maturing in Yarmouth gardens; such summer-flowering plants as *Xyris caroliniana*, *Habenaria blephariglottis* and *H. psycodes*, *Bartonia virginica* and *Gratiola aurea* were as early as in southern New Jersey; and such autumn-flowering plants of New Jersey as *Spiranthes cernua*, *Chelone glabra*, *Solidago puberula*, *S. sempervirens*, *S. rugosa*, *S. Elliottii*, *S. uniligulata* and *S. graminifolia*, *Gnaphalium obtusifolium*, *Cirsium muticum* and *Prenanthes trifoliolata*, in southern Nova Scotia begin flowering in midsummer, often a full month earlier[1] than in southern New Jersey. Another peculiarity of this region of Nova Scotia, one which we were tempted to attribute to the dense and protracted fogs, was the almost complete lack of mosquitoes. We had been most happily surprised to find that we could go anywhere on these boggy barrens without meeting this much-to-be-expected tenant. But in explanation some one suggested during the summer, that in such a dense atmosphere mosquitoes, if they there exist, must remain in the larval stage, wings being quite useless to them!

The Tusket party brought in a very extreme plant of the *Carex Goodenowii* affinity, only in this plant the perigynia have long, slender stipes. This proves to be *C. Goodenowii*, var. *strictiformis* (Bailey) Kükenth. an endemic American variation which, in its extreme development, is very definite. And, to my delight, they had typical *Ranunculus Flammula*, the handsome subaquatic plant of Europe which I had known in eastern Newfoundland, now for the first time collected on the mainland of eastern North America. At Tusket it

[1] Our earliest flowering specimens from Nova Scotia and the earliest date of flowering in southern New Jersey (copied from Stone's *Plants of Southern New Jersey*) are given below.

	Nova Scotia	Southern New Jersey
Spiranthes cernua	August 31	early September
Chelone glabra	August 4	late August
Solidago puberula	July 21	early September
Solidago sempervirens	August 10	early September
Solidago rugosa	August 10	late August
Solidago Elliottii	August 13	early September
Solidago uniligulata	July 20	early September
Solidago graminifolia	August 9	late August
Gnaphalium obtusifolium	August 7	late August
Cirsium muticum	July 13	mid-August
Prenanthes trifoliolata	August 10	late August

grows in its characteristic habitat, a cold spring-brook. And Mrs. Graves was absolutely positive that, just as they were boarding the train at Tusket, a woman, who drove up in an automobile, had in her hand a bunch of the so-called Plymouth Gentian, *Sabatia Kennedyana* Fernald,[1] the most beautiful wild flower of the Cape Cod region. We should, perhaps, have been content with our collections of the day and not have insisted on pressing Mrs. Graves with the illogical query: "Why in the world didn't you ask where she got it?" Obviously, it would have been useless, for the train had started. But that unexplained *Sabatia* haunted us and we could not drive it out of our minds.

Two days were necessary to get the presses in order before leaving, on August 16, to examine the coastal sands of Queens County, our headquarters for two days being at Port Mouton (everywhere in Nova Scotia pronounced "Port Mut-toon"). Promptly after dinner Graves, Long and Linder started for the dunes at Central Port Mouton, bringing back such novelties as *Juncus bufonius*, var. *halophilus*, *Euphorbia polygonifolia* and, from a bushy pasture, a greater variety of *Crataegus* than we had yet seen. They also had found again *Polygonum Raii* and *Sagina nodosa* which we had seen in the damp sands at Villagedale. Bissell and I were having better luck. We had gone to the mouth of Broad River where, until a violent storm of the preceding winter tore it away, a great range of dunes had long existed. We found the sand-plants the others were getting and in one strip of brackish sands a few plants of the rare *Rumex maritimus*, var. *fueginus* (Phil.) Dusen,[2] formerly known from Sable Island and the Magdalen Islands but not from the mainland of Nova Scotia. A beautiful little boggy pocket in the midst of hideously burned and charred spruce woods gave us some of the coastal plain specialties we had been getting in Yarmouth County: *Schizaea pusilla*, *Thelypteris simulata*, *Juncus subcaudatus*, *Ilex glabra* and the two Bartonias of sloughs.

Next morning we all went to the dunes at Central Port Mouton, hoping by further exploration to add some species we had expected to see in such a habitat, but the most interesting discovery was to find that the typical dune species, *Carex silicea*, was quite absent from the

[1] Rhodora, xviii. 150, t. 121 (1916).
[2] See St. John, Rhodora, xvii. 81 (1915).

dunes but growing in the crevices of a rocky headland along with *Smilacina stellata*, which we had also failed to see on the dunes. In a boggy thicket we were somewhat surprised to find the tangle of *Ledum groenlandicum* (subarctic) and *Ilex glabra* (Louisianian) stretching above our heads, and specimens of the *Ledum* which we collected show the trunks and main branches to be practically 2 m. (19.5 dm.) high.

In the afternoon Bissell and Graves went to the mouth of Broad River, returning with *Conioselinium chinense* from a patch of rich, old woods, and bringing in the largest *Bartonia virginica* of the season (3 dm. high).

Long, Linder and I spent the afternoon near Port Joli (pronouncde Jolly) following a supersaturated corduroy-road back to Louis Lake, which had been described to us as shallow and "full of weeds." The border of the lake proved to be a quaking bog and, without a boat, we were forced to content ourselves with merely imagining all sorts of exciting things in the swimming mass of vegetation. The *Ilex verticillata* in the bog had densely pubescent leaves, var. *padifolia*, which we had not known east of Massachusetts, and the bog itself was the home of *Arethusa*, now abundantly fruiting and a welcome sight in view of its rapidly approaching extinction in the eastern states.

Next morning there was time for some short local tramps before the early afternoon train back to Yarmouth, but the only striking novelty was *Crataegus Jonesae*, one of the most definite of species, supposed to be confined to the Maine coast, brought in by Bissell and Graves from the shore east of Port Mouton.

The Graves's time was getting short and there were too many things to do, so it was necessary to crowd the program. We were planning another trip away from Yarmouth, to start early on the morning of the 21st, but we decided that on the 20th we could take a simple automobile trip into the interior, just to see what the country was like; and since we had previously failed to reach our destination, when we started for Carleton and Kemptville, that direction seemed the natural one to take. Our route lay up the Tusket valley and, after a few stops, we succeeded in getting above Tusket Falls, when some one thought he saw an interesting plant on a wooded slope above Tusket (or Vaughan) Lake. The shore of the lake was

obviously of no interest, being bushed close down to the water and with absolutely no beach exposed, but, tiring of waiting for the others to return, I pushed idly through the bushes to the water's edge and there, with flowers fully expanded under several inches of water, was the beautiful Plymouth Gentian, *Sabatia Kennedyana*, the Rhode Island and southeastern Massachusetts representative of *S. decandra* of southern Georgia and Florida (fig. 12). Mrs. Graves's observation was splendidly corroborated, and we could not pass such a spot even if Carleton and Kemptville again had to wait. With the *Sabatia*, deep under water, were the coastal plain *Coreopsis rosea*, its previous northeastern outposts in eastern Massachusetts; typical *Habenaria flava*, the *Asclepias incarnata* of Grand Lake and *Rynchospora capitellata*, var. *discutiens* again; and, best of all, a very evident relative of the southern *Panicum longifolium*, the latter species (fig. 16) known as far north as New England only in southern Connecticut and adjacent Rhode Island. Our consciences were becoming troubled by the full boxes (we had merely gone for a ride) of specimens to be cared for and thoughts of that early train next morning so, just as on the previous trip up this valley, we drove on only to Pleasant Valley, where we took a crossroad to Yarmouth. But, as we were turning, Bissell spied in the sand near Sloane Lake, a goldenrod of the *Euthamia* section, which we had not had, the typical thin-leaved, coastal plain *Solidago tenuifolia*, previously unknown east of York County, Maine, though abundantly represented in Nova Scotia by the endemic variety of pond-margins (p. 143).

In September, 1917, Mr. Chesley Allen collected,[1] on a savannah between Little River and East Ferry on Digby Neck, a single plant of *Lophiola*, a most characteristic plant previously unreported from north of the New Jersey pine barrens, and all summer we had been awaiting the right opportunity and settled weather in order to go for a few days to Digby Neck, not only to rediscover *Lophiola* if possible but because we took that plant to be an index to a probably interesting lot of isolated coastal plain species. Anyone who knows the montane character of Digby Neck, forming a slender continuation, in places less than a mile wide, of the North Mountain for about 40 miles between the Bay of Fundy and St. Mary's Bay,—anyone who knows this slender montane peninsula with the bleak

[1] See Nichols, RHODORA, xxi. 68 (1919).

Bay of Fundy washing its outer shores would think us crazy to go there for coastal plain plants. But we could not overlook the occurrence of *Lophiola* there. So, as the psychological moment had come, the weather clearing, with wind in the west, we went on the 21st by train to Weymouth, thence to cross by boat in the late afternoon (when the tide would be right for going down Sissiboo River) to Sandy Cove on the Neck.

Before time for the boat we collected extensively about Weymouth, sending our plants back to Yarmouth by Bissell who had elected to return and to care for the accumulated material during our absence, and before supper the rest of our party landed at Sandy Cove, a beautiful harbor shut in by basalt cliffs. As we landed we wondered where in such a place to look for plants of the sandy coastal plain, but upon leaving the wharf we saw by the damp roadside carpets of the Nova Scotian purple gerardia, *Agalinis neoscotica*, northern representative of a coastal plain genus.

East of Sandy Cove lies a large lake, Lake Midway or Centerville Lake, and south of that a small pond in the woods, and to the west, at the head of Little River, the map indicated a chain of small lakes. So, on the morning of August 22, the Graves's and Linder were driven east to Lake Midway and Long and I went west. Our driver, Mr. R. W. Sypher, who knows the Neck intimately, told us that the lake east of Tiddville had been drained in order to quarry the infusorial earth which had formed its bed, and, when we first caught sight of one of the small remaining pools beyond some hills, we hurried across to prospect, and there was *Lophiola*, tall and just coming into bloom, acres and acres as far as the eye could see. There was obviously no need to go as far as East Ferry, so we drove only to Tiddville and spent the day following the savannah eastward along the Little River, a stream which might often be crossed "in two jumps." Our list for the day is a long one so it must be here cut down to the specialties, most of the distinctive coastal plain plants of the Yarmouth County bogs: *Schizaea*, *Xyris caroliniana* and *X. montana*, *Calamagrostis Pickeringii*, *Carex exilis*, *Lycopodium inundatum*, var. *Bigelovii* and *Ilex glabra;* in the pools and small pond-holes *Utricularia purpurea* and *U. geminiscapa*, *Nymphaea odorata*, var. *rosea*,[1] and

[1] The flowers of *Nymphaea odorata*, var. *rosea* are by no means always pink, in fact they oftener have white inner petals. The plant is more familiarly known as

Eleocharis Robbinsii; and, rare in the mud, *E. olivacea;* a pretty good list of coastal plain types to find within half a mile of the cold rocks of the Bay of Fundy. *Lophiola* was abundant, coloring the savannahs for two or three miles with its misty, white corymbs, its yellow-bearded and reddish expanded perianths certainly suggesting the English name, Golden Crest.

The genus *Lophiola*, although placed by Bentham & Hooker in the *Haemadoraceae*, is by other systematists placed in the tribe *Conostylideae* of the *Amaryllidaceae*. This tribe has 50 species confined to southwestern Australia, 1 species at the Cape of Good Hope and the genus *Lophiola*, with three localized areas: one extending from Mississippi to Florida and southern South Carolina; another the pine barrens of New Jersey and adjacent Delaware; the third, the savannahs on Digby Neck (fig. 17). But the plant of Digby Neck has a further claim to interest. The genus was based on a plant said to have been carried back to England by John Lyon in 1812 and there cultivated and, in 1813, illustrated and described from a plant which flowered in England. Lyon, it would seem, from what little is recorded of him, had lived at Philadelphia until, in 1806, he returned to England "with 14 new spp."[1] He soon returned to America and devoted his energies to botanical exploration of North and South Carolina, Georgia and Florida, whence he returned to England in 1812; "he assiduously explored this region [the Carolinas] from Georgia as far north at least as the Grandfather Mountain, and died at Ashville . . . . . some time between 1814 and 1818."[2]

Now the case would not be specially complicated if *Lophiola aurea* were, as has been generally supposed, a monotype; but close study shows that the plants of the three different areas are quite distinct species, the plants of the South and of New Jersey having olivaceous capsules free from the perianth only above the middle and seeds

var. *minor* Sims, but the latter name was substituted by Sims for Pursh's earlier one because, when cultivated in England, the variety had white flowers. The bibliography is as follows:

NYMPHAEA ODORATA, var. ROSEA Pursh, Fl. Am. Sept. 369 (1814). *N. odorata*, var. *minor* Sims, Bot. Mag. t. 1652 (1814); Conard, Waterlil. 183, fig. 68 (1905). *N. minor* (Sims) DC., Veg. Syst. ii. 58 (1821). *N. odorata*, var. *parviflora* Raf., Med. Bot. ii. 45 (1830). *N. rosea* (Pursh) Raf., l. c. (1830). *Castalia odorata*, forma *rosea* (Pursh) Britton, Cat. Pl. N. J. 44 (1889). *C. odorata rosea* (Pursh) Britton acc. to Morong, Mem. Torr. Bot. Cl. v. 154 (1894).

[1] Britten & Boulger, Biogr. Ind. Brit. and Irish Bot. 109 (1893).

[2] Gray, Lond. Journ. Bot., i. 11 (1842).

blunt at both ends, the Nova Scotia plant, as shown by fruiting material collected in October by Mr. Sypher, having the red capsules free two-thirds their length and bearing seeds which are commonly tailed at one end. The two southern plants flower in early summer, the Nova Scotian from mid-August to October. The great difficulty arises in interpreting the original description and plate, for the plate, in such characters as are shown, very closely matches Nova Scotian material but is not a good match for most specimens of either the New Jersey or the more southern species.

I have been generously loaned or have had access to all the material of *Lophiola* in the herbaria of the New York Botanical Garden, the Philadelphia Academy of Science, the National Museum and the Missouri Botanical Garden and in all the collections find but two sheets, both collected somewhere in Florida by Rugel, which compete with the plant of Digby Neck in resembling the original plate of *L. aurea*. These two sheets are of unusually large-flowered material of the southern species, and, when we bear in mind what we know of Lyon's movements between 1806 and 1812 and that the plate was made from cultivated material, it seems wiser to apply the name *L. aurea* to the southern plant than to force it upon the superficially somewhat similar plant of Nova Scotia. The Nova Scotia plant should, therefore, be treated as a new species, the New Jersey plant being *L. americana* (Pursh) Wood.

Graves and Linder found Midway Lake with a bouldery and uninteresting shore, though at one point they were able to get *Myriophyllum tenellum* and a beautiful lot of freshly flowering *Utricularia resupinata* (from Florida north), making our ninth species of the genus. They also got *Potamogeton Oakesianus* and *P. bupleuroides*, the latter species new to our collections, and on the Fundy shore, Graves got *Sedum roseum* and *Polygonum allocarpum*, both typical plants of this coast.

Before leaving Sandy Cove for Digby on the 23rd, Long and I stole out in the early morning to the little pond which lies almost in the village. We were told: "It never had a name, but some folks call it Lily Lake;"—so we will call it Lily Lake. In a deep muddy cove were two splendid plants, the northern *Myriophyllum Farwellii* (alpine ponds of Gaspé to northern New England, northern New York and northern Michigan) and, mingled with it, that hand-

some pondweed with purple-mottled stems, *Potamogeton pulcher*, heretofore unknown northeast of Nantucket and of York County, Maine (fig. 15).

After the Sandy Cove trip Dr. and Mrs. Graves felt that they must get back to Connecticut and we attempted to forget the loss of their good comradeship by ourselves travelling as far in the opposite direction—to Cape Breton; Bissell and Linder to North Sydney as a base, Long and I to Baddeck, to the hospitable home of Mr. and Mrs. Charles T. Carruth of Cambridge. The region including Baddeck and North Sydney had already been much botanized by John Macoun and by many amateurs, so that we anticipated no noteworthy discoveries; but we naturally wanted a glimpse of this region of Carboniferous sandstones, gypsum-cliffs and limestones, especially to compare it with the acid southwestern counties. And the comparison was truly a contrast. We saw absolutely none of the coastal plain specialties which all summer had occupied our concentrated attention. Around the gypsum outcrops at Port Bevis (near Baddeck) were many of the species which Long and Pease had got in similar habitats along 5-Mile River or which we had from Truro: *Cystopteris bulbifera, Carex eburnea, Sphenopholis pallens, Erigeron hyssopifolius*, etc. in the rock crevices; *Pteretis nodulosa, Poa costata, Carex retrorsa, Ranunculus recurvatus, Solidago latifolia* in the woods; *Ranunculus Purshii* in the pools; and a few we had not previously seen: *Shepherdia canadensis* in the talus, *Gnaphalium sylvaticum* in pastured woods and other half-natural but doubtfully native habitats, *Cornus Amomum* along a brook, and the boreal *Scirpus pauciflorus* in the border of a salt marsh near Baddeck where the southern *Distichlis spicata* abounds. In a cold brook with *Potamogeton alpinus*, was a vigorous growth of *P. vaginatus* Turcz.,[1] a boreal, circumpolar species not before known in Nova Scotia, and here, as on Prince Edward Island, in New Brunswick, and on the Labrador Peninsula without good fruit; and at the mouth of a brook entering Baddeck Bay the colony of *Thelypteris palustris* (*Aspidium Thelypteris*) was as deliciously fragrant as Vanilla Grass (*Hierochloe odorata*). This fragrant form of the Marsh Fern has been previously known from a collection made by Miss Sarah F. Sanborn in southern

[1] See St. John, RHODORA, XX. 191 (1918).

New Hampshire. It is *Thelypteris palustris*, forma *suaveolens*.[1] We had hoped to find new stations for the two local species, *Polygonum acadiense* (already referred to, p. 134) and *Agropyron acadiense* Hubbard,[2] which Dr. St. John and I had discovered in 1914 at Grand Narrows, but, in our searching of the beaches about Baddeck, Long and I found only a solitary plant of the *Polygonum*, on Kidstone's Island, here, as at Grand Narrows, associated with *P. Raii*, and at this station with *Agropyron pungens* clearly passing into *A. acadiense*.

Bissell and Linder, in the meantime, were having their best collecting in the rich woods about a lime quarry on a mountain near George River. They got many of the species we were finding and some others new to our summer's collections: gigantic *Thelypteris Filix-mas* (L.) Nieuwl., the only *Cystopteris fragilis* of the whole summer, *Athyrium acrostichoides*, *Carex Bebbii*, *C. aurea*, *Satureja vulgaris* and other plants of sweet or basic soils, though at the leached summit of the mountain they found a typical acid bog with *Rubus Chamaemorus* and the other common acid bog plants.

Dr. and Mrs. Webster having told me of a spot near Gavelton, on the Tusket, where they had found *Sabatia Kennedyana* without having to reach under water for it, as we had been forced to do, Dr. Webster most kindly took Long and me to the station on the morning of September 2nd, and there, near the foot of Gavelton (or Butler) Lake, he introduced us to a most fascinating savannah. Our time was very limited but enough to indicate what was to be the next day's work. Unfortunately Bissell could not share in this, one of the best days of the season, for he returned home on the night of the 2nd; but on the 4th Long, Linder and I went to Gavelton prepared for a full day of collecting.

Sabatia was abundant both on the wet savannah and the cobbly beaches and, of course, all the specialties we had previously found with it. *Proserpinaca palustris* and *P. pectinata* (Florida to southern Maine), the Atlantic American representatives of the tropical and austral tribe *Halorrhageae*, a tribe with most of its species in Australia, were abundant on the savannah and with them, clearly a hybrid of the two, as it likewise seems to be in eastern Massachusetts

[1] THELYPTERIS PALUSTRIS Schmidel, forma **suaveolens** (Clute), n. comb. *Nephrodium Thelypteris*, forma *suaveolens* Clute, Fern Bull. xviii. 87 (1910).

[2] RHODORA, xix. 15 (1917).

and Rhode Island, *P. intermedia* Mackenzie,[1] originally described from the pine barrens of New Jersey and from Georgia. *Polygonum Muhlenbergii*, first east of the Penobscot, *P. robustius* and *Glyceria pallida*, first east of southern Maine, abounded. The southern *Panicum dichotomiflorum* grew on shores or at the border of the savannah, and the tall clumps of *Juncus canadensis* had an unusual appearance owing to the very few (3–7) flowers in the scattered glomerules borne on long, almost erect branches, the inflorescence thus suggesting that of *J. brevicaudatus* but the plant clearly an extreme variation of *J. canadensis*, with the perianths unusually long for the species (3.5–4 mm. long). Typical *J. canadensis* has the flowers very numerous in the glomerule, the branches less rigidly erect and the perianth from 2.5 to very rarely as much as 3.5 mm. long. Linder and I later (in October) traced the extreme variety nearly to the headwaters of the East Branch of the Tusket, and although it sometimes intergrades with typical *J. canadensis* it seems worthy of recognition as a variety. Upon looking up the collections made by Long and me on Cape Cod in 1918 I find that at one of the ponds in Dennis we got this same peculiar variety of the Tusket valley.

On the beach of the lake *Woodwardia areolata* of southern, wet cypress swamps and *W. virginica* of coastal plain quaking bogs were growing among the cobble-stones, and the finest Bog Cranberry, *Vaccinium macrocarpon*, I had ever seen was here trailing over the quartzite boulders; while the dominant blueberry of the rocky shore was *Vaccinium vacillans*, heretofore unknown in New England east of southern York County, Maine, although there are records of it from Nova Scotia.

This was to have been our last day in the field, for the calls of home and the opening of the academic year could not be indefinitely postponed, but it did seem "hard luck," just as we were packing to leave Nova Scotia, that the isolated coastal plain types were so rapidly developing. By working overtime, however, and blessed at last by brilliant September sunshine, we got the presses into shape and took just one more day in the field. On September 6 we went over the only bad road we encountered in Yarmouth County, to Great Pubnico Lake, a splendid lake but with water, as everywhere else, uncomfortably high. On the sandy shore with the

[1] Mackenzie, Torreya, x. 250 (1910).

conventional but still very choice coastal plain species was *Rhexia virginica,* which we had had only from Randel Lake; but the great surprise was a boggy savannah at the border of the lake where, at least close to the lake, the two dominant sedges were the northern *Carex oligosperma* (Labrador to Great Bear Lake—at the Arctic Circle, south to northern Pennsylvania, Michigan and Minnesota) and *Eleocharis tuberculosa* (Texas to Florida and north to eastern Massachusetts, see fig. 14). On the way back to the railroad and again near Pubnico station we were greatly interested in *Spiranthes cernua,* var. *ochroleuca.* Typical white-flowered *S. cernua,* with delicious fragrance suggestive of the Pond Lily, had been common and blooming freely in sterile meadows but this much larger plant with elongate bracts and yellowish flowers of disgustingly pungent odor was just beginning to bloom and grew in dry habitats, either open, sandy fields or rocky barrens.

After making a circuit on the 7th, to secure fruiting material of *Rubus* and other specialties, we quickly packed the boxes and on the 9th sailed on the Prince Arthur, satisfied with our summer's work, though fully conscious that we had barely scratched the surface. Of the more than 2,600 lakes in the silicious belt we have visited exactly 40 and have almost made the circuit of just 1; of the innumerable savannahs and inland marshes we have been on 4; we have not touched the sandy valleys of the Clyde, Roseway, Jordan, Sable and other rivers to the east; the regions where *Ilex opaca* and *Rhododendron maximum* have been reported are still to be investigated; and we have not yet located *Ceratiola.*

But the season was not yet over. Many problems promptly arose as soon as the material was unpacked, so, on October 5, Linder and I sailed on the Prince George back to Yarmouth where we spent three strenuous days, out from sunrise to sunset, collecting fruit of critical groups and adding whatever of novelty the lateness of the season would allow.

A *Bidens* growing in a cold bog at Sand Beach, a plant we had earlier collected in the most immature condition, seems like *B. connata,* var. *gracilipes* Fernald[1] of the Cape Cod quagmires but its achenes are nearly twice as long; apparently an endemic variety. At last we reached Carleton and Kemptville, trailing *Sabatia Kennedy-*

[1] Rhodora xxi. 103 (1919).

ana, *Panicum longifolium*, etc., all the way and later to the head of the East Branch of the Tusket where we also found *Rhexia virginica*, *Proserpinaca pectinata* and *Polygonum robustius*. There are some beautiful savannahs on the East Branch which, earlier in the season, would repay careful exploration. At the border of one was as handsome a *Polygonum* as I ever saw, a slender perennial, obviously a variety of *P. hydropiperoides*, but extremely tall (1–1.5 m.), with leaves almost 2 dm. in length, and with the thick (often 1 cm.) pink spikes sessile in mostly digitate fascicles at the tips of the branches. Typical *P. hydropiperoides*, which we found common in Yarmouth County, has much shorter leaves and the more slender spikes (commonly described as "filiform") scattered along the flowering branches.

This was the end of the collecting but only the beginning of the more exacting and unending task of accurately working out the results—17,000 sheets of carefully prepared specimens representing 3,600 numbers, nearly every isolated species to be intensively studied, lest, like the *Lophiola*, we should superficially place it with the wrong species. And, although the detailed results cannot yet be fully stated, it is now safe to say that, of the indigenous vascular flora of silicious southwestern Nova Scotia, approximately 150 out of the 800 known species are either isolated from the more continuous coastal plain flora of the South or are endemic derivatives from it, while such a typical coastal plain genus as *Bartonia* seems in Nova Scotia to be more highly developed than on the coastal plain itself. Further exploration will greatly increase the proportion of isolated coastal plain types, for we have glimpsed scarcely 1% of the silicious area and most of the significant plants are highly localized and found where least expected. But if there were need of further evidence that, since the Pleistocene glaciation the continental shelf of eastern North America has been high in the air, affording an essentially continuous line of migration across the mouth of the Gulf of Maine to Nova Scotia, thence to Newfoundland, that evidence is now abundantly at hand. A striking feature of this migration northward of the southern coastal plain flora is the fact, that several distinctive species or genera, *Schizaea pusilla* (fig. 11), *Lophiola* (fig. 17), *Habenaria flava*, and perhaps *Ceratiola*, reached Nova Scotia without establishing colonies on Long Island, Cape Cod or Nantucket. This would seem to indicate that the uplifted shelf was a region of some

complexity or else some subtle qualities in the habitats of these plants.

And what of the much overworked life-zones based alone upon temperature? In a region where the Louisianian[1] *Lycopodium inundatum*, var. *Bigelovii* (*L. adpressum*) and the Louisianian and Carolinian *Utricularia subulata* (fig. 4) creep among the bases of *Carex Goodenowii* (Greenland and arctic America, south to Nova Scotia and eastern Massachusetts) or of *Juncus filiformis* (Greenland to Massachusetts and the mountains of Pennsylvania); where the Louisianian and Carolinian *Eleocharis tuberculosa* (fig. 14) vies with *Carex oligosperma* (Labrador to Great Bear Lake, etc.) for the possession of the edge of a savannah; where the dominant undergrowth in the spruce, fir, and larch swamps includes the Louisianian and Carolinian Inkberry (fig. 3), and such a distinctly southern plant as *Solidago Elliottii;* where the Inkberry makes tall thickets with *Ledum groenlandicum* or pushes its branches through the carpet of arctic Crowberry, *Empetrum nigrum* (fig. 2), or the arctic Cloudberry or Bakeapple (*Rubus Chamaemorus*);—in a region where these commingling of Arctic or Hudsonian with Louisianian or Carolinian species are met at every turn, one is certainly perplexed to make Merriam's zones fit the facts. My friends in the more arid and elevated regions of the West seem to find them of practical value, and in our own upland country they are useful concepts if their use is constantly tempered by that rarest of virtues, sound judgment; but in our humid and lowland regions of the Northeast they are so tangled that it is doubtful whether a commensurate return can be gained from the effort to untangle them. Incidentally, Merriam makes the moose an indicator of the Hudsonian. How lost this great animal must feel in Yarmouth County as it breaks its way through the thickets of Inkberry and tangles of Green Brier to the lake-margins, there to browse on the Louisianian and Carolinian *Brasenia*, *Nymphoides* or *Solidago tenuifolia!*

I have laid great emphasis upon the seemingly unfair proportion of fog and "Scotch mist" in southwestern Nova Scotia, although we were constantly assured that we were having "beginner's luck" and seeing an abnormal summer. I have also indicated the very

[1] The warmer "zones" to which the southern species are accredited are those indicated for them in Mohr's *Plant Life of Alabama*.

diverse habitats of coastal plain plants in that region: *Schizaea pusilla* growing either in the wettest of sphagnous quagmires, in the dryish Cladonia heath or even in rock-crevices; *Woodwardia virginica*, of quaking bogs southward, or *W. areolata*, of our wet or mossy woods, taking to cobble beaches; the Bog Cranberry reaching phenomenal development among quartzite boulders; the Inkberry indifferent whether it grows in the deep shade of spruce woods, on open sphagnous bogs or in dry blueberry pastures; *Panicum Lindheimeri*, of dry open sands southward, represented in Nova Scotia by a plant of inundated quagmires; and *Solidago tenuifolia*, of coastal plain sand-plains, with a Nova Scotian representative found only in the lake-margins. Is not this very general interchange of habitats due, to a great extent, to the unusually moist atmosphere and greatly retarded evaporation? Where there is abundant moisture everywhere the plants secure what they need, even in comparatively dry habitats.

Another point, and the last: in the areas we explored, this remarkable flora derived from the southern coastal plain was restricted to or at least obvious only in the region of acid rock, the "gold-bearing series" and their adjacent granites, the cool Atlantic slope of Nova Scotia or (as on Digby Neck) in extensive areas of acid savannah. Wherever we tapped the regions with limestone, gypsum or basalt, regions with but slightly acid or sweet or basic soils, the coastal plain types were found only on sphagnous bogs or on long-weathered and leached crests or open plains. Instead, as at George River, Port Bevis, Baddeck, Truro, Folleigh, 5-Mile River and the southern slope of the North Mountain, the plants which gave distinction to the regions were such Canadian or Alleghenian calcicoles or denizens of rich woods as *Thelypteris Filix-mas*, *Cystopteris bulbifera* (fig. 6), *Pteretis nodulosa*, *Equisetum scirpoides*, *Milium effusum*, *Sphenopholis pallens*, *Festuca nutans*, *Asperella hystrix*, *Carex rosea*, *C. aurea*, *C. eburnea*, *Juncus Dudleyi*, *Listera convallarioides*, *Ostrya virginiana*, *Laportea canadensis*, *Ranunculus Purshii*, *R. recurvatus*, *Dentaria diphylla*, *Amelanchier canadensis* (fig. 8), *Fragaria vesca*, var. *americana*, *Geum virginianum*, *Geranium Robertianum*, *Shepherdia canadensis*, *Circaea latifolia* and *C. canadensis*, *Aralia racemosa*, *Sanicula gregaria*, *Osmorrhiza Claytoni* and *O. divaricata*, *Satureja vulgaris*, *Solidago latifolia*, *S. serotina* and *Erigeron hyssopifolius* (fig. 7).

These conclusions are based upon careful records, entered every night for more than two months by all members of the party, of everything seen during the day. They show very emphatically that, whereas the distinctive flora of the highly acid but cool Atlantic slope of Nova Scotia has been derived very largely from the now submerged continental shelf and has its affinities far to the south, the distinctive flora of the warmer, inland and less acid or even calcareous regions of the province, the regions of farms and apple and peach orchards, has come from the north, northwest or west by way of New Brunswick. This situation suggests the contrasts in the flora of Newfoundland elsewhere discussed,[1] where the cold, foggy and bleak acid southeastern region is distinguished by a flora derived from the acid sands and peats of the southern coastal plain; the warmer, sunny, calcareous western region by a calcicolous flora allied to those of the calcareous Arctic Archipelago and the Canadian Rocky Mountains.

(*To be continued.*)

OLD-TIME CONNECTICUT BOTANISTS AND THEIR HERBARIA,—II.

C. A. Weatherby.

(*Continued from p. 125.*)

Barratt's botanical activities began in England and extended, apparently, to about 1845. There is a specimen in his herbarium dated 1867, but most of his collecting was done before the former date. As a botanist, his impulse was toward research and original work. He was interested in the life history and morphology of plants. On a sheet preserved with one of his letters to Torrey are acute observations on such subjects as the bulblets of *Nymphoides* and their function and the germination of the seeds of *Orontium*. Groups which were taxonomically difficult or insufficiently studied attracted him. Of them he collected freely, to show their different forms, both for himself and abundant duplicates for his correspondents. "I constantly take in my carriage" he wrote to Torrey, "one or 2 large portfolios and collect through the season a great number of our finest and rarest plants." One hopes that no patient's colic had

[1] Fernald, Am. Journ. Bot. v. 237–247 (1918).